General Science and ability

Part-II

Section-A

Q. No. 4:

a). Explain the role of heart and blood vessels in circulation.

Answer:

Introduction:

The circulatory system is a vital organ system responsible for the continuous transportation of blood throughout the body. It plays a crucial role in supplying oxygen and nutrients to tissues, removing metabolic wastes, and maintaining internal balance. The heart and blood vessels function as the core components of this system, working in close coordination to ensure efficient circulation.

The **heart** acts as a muscular pump, while **blood vessels** form a network of tubes that distribute blood efficiently.

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Role of the Heart:

The heart is a four-chambered muscular organ that maintains circulation by rhythmic contraction and relaxation.

Right atrium and ventricle:

Receive deoxygenated blood from the body and pump it to the lungs (pulmonary circulation)

Left atrium and ventricle:

They receive oxygenated blood from the lungs and pump it to the entire body. (systemic circulation).

Example:

The left ventricle has the thickest muscular wall because it pumps blood to the whole body under high pressure.

Psychological Fact:

An average human heart beats about 72 times per minute and

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pumps nearly 5 liters of blood per minute at rest.

Role of Blood Vessels:

Blood vessels transport blood to and from the heart and body tissues.

- **Arteries:**

Arteries carry oxygenated blood away from the heart except pulmonary artery. e.g. aorta

- **Veins:**

Veins return deoxygenated blood to the heart except pulmonary vein. e.g. Vena Cava.

- **Cappillaries:**

Cappilaries allow exchange of gases, nutrients, and wastes at tissue level

Example:

Cappilaries in the lungs enable oxygen to diffuse into blood and carbondioxide to diffuse out.

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Circulatory Flow:

Body Tissues

↓

Vena Cava → Right atrium → Right ventricle

↓

Lungs (oxygenation)

↓

Pulmonary Vein → Left atrium → left ventricle

↓

Aorta → Body tissues.

Conclusion:

The heart and blood vessels work together as a coordinated system to maintain life by ensuring efficient circulation. Any defect in this system, such as blocked arteries, can severely affect body functions.

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b. What is cyclone? Describe the formation of cyclone.

Answer:

Introduction:

A cyclone is a large scale atmospheric system characterized by low air pressure at the centre, around which strong winds rotate inward and upward. Cyclones are usually associated with heavy rainfall, thunderstorms, and strong winds, particularly in tropical and subtropical regions.

Conditions necessary for Cyclone Formation:

The formation of a cyclone requires specific atmospheric and oceanic conditions:

- Warm ocean water with sea-surface temperature above 26.5°C.
- Low atmospheric pressure near the surface.
- High humidity in the lower and middle troposphere.
- Coriolis force to initiate rotational motion (absent near the equator)

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- Low vertical wind shear to maintain structural integrity.

Example:

Tropical Cyclones frequently develop over the Bay of Bengal and Arabian Sea, affecting Pakistan, India, and Bangladesh.

Process of Cyclone Formation:

The formation of a cyclone occurs through the following stages:

1. Warm, moist air over the ocean rises, creating a low-pressure area.
2. Surrounding air rushes toward the low-pressure zone and begins to rotate due to the Coriolis force.
3. Continuous condensation releases latent heat, further intensifying uplift.
4. A well-defined system with a central eye, eyewall, and spiral rainbands develops.

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Cyclone Formation:

Warm Ocean water

↓

Rising Moist air

↓

Low Pressure area

↓

Rotation due to Coriollis force

↓

Release of latent heat

↓

Cyclone Development

Relevant Fact:

A mature tropical cyclone can have wind speeds exceeding 119 km/h, at which point it is classified as a tropical cyclone or hurricane.

Conclusion:

Cyclones are powerful atmospheric disturbances formed due to the interaction of oceanic heat and atmospheric dynamics. Understanding their formation is essential for disaster preparedness and mitigation.

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e. Enlist the functions of: Carbohydrates, proteins, fats, Calcium and Iron.

1. Carbohydrates:

Definition:

Cabohydrates are organic campounds composed of carbon, hydrogen, and oxygen. They are the chief source of energy for the human body and are required in large quantities for daily activities

Examples:

Rice, wheat, bread, sugar, potatoes, fruits.

- **Functions of Carbohydrates:**

. Primary source of energy for the body.
. Maintain bladd glucose levels.
. Stored as glycogen in liver and muscles for future use.
. Aid in proper functioning of the brain and nervous system.

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- Help in the metabolism of fats.

Proteins:

Proteins are complex organic compounds made up of amino acids. They are essential for growth, development, and maintainance of body tissues.

Examples:

Meat, eggs, milk, pulses, fish, beans.

Functions of Proteins:

- Essential for growth and repair of body tissues.
- Formation of enzymes, hormones, and antibodies
- Maintain body structure such as muscles, skin, and hair.
- Act as a secondary source of energy when carbohydrates are insufficient.
- Help maintain fluid and acid - base balance.

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Fats:

Fats are concentrated energy yielding nutrients composed of fatty acids and glycerol. They are essential for normal body functioning despite being required in small amounts.

Examples:

Butter, ghee, oils, nuts, cream.

Functions of Fats:

- Concentrated source of energy.
- Insulate the body and maintain body temperature.
- Protect vital organs from mechanical injury.
- Aid absorption of fat-soluble vitamins (A, D, E, K)
- Provide essential fatty acids for cell function.

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Calcium:

Calcium is an essential mineral required mainly for the development and maintanance of the skeletal system.

Examples:

Milk, yogurt, cheese, green leafy vegetables, fish with bones.

Functions of Calcium:

- Formation and maintenance of bones and teeth.
- Essential for muscle contraction.
- Required for blood clotting.
- Supports nerve impulse transmission.
- Maintains normal heart rhythm.

Iron:

Iron is a vital trace mineral necessary for the formation of red blood cells and proper oxygen transport.

Examples:

Liver, red, meat, spinach, legumes, dates.

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Functions of Iron:

- Essential for formation of hemaglobin in red blood cells.
- Facilitates transport of oxygen in the blood.
- Supports cellular respiration.
- Prevents anemia.
- Important for proper immune system function.

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d. How remote sensing can be employed for environmental purposes?

Answer:

Use of remote Sensing for Environmental Purposes:

Introduction:

Remote sensing refers to the technique of aquiring information about the Earth's surface and atmosphere from a distance, usually through satellites or aircrafts, without physical contact. It plays a vital role in monitoring, managing, and protecting the environment.

Monitoring Natural Resources:

Remote Sensing allows precise observation of forests, water bodies, and soil conditions. For example, satellite imagery from NASA's Landsat program is used to assess deforestation rates in Amazon, helping authorities plan conservation efforts.

Similarly, it helps to monitor water resources, track changes

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in rivers, lakes, and reservoir and detect soil degradation in agricultural areas.

Environmental Pollution Detection:

Remote sensing is used to detect and monitor air and water pollution. **For instance,** Satellite sensors can track oil spills in oceans, industrial emissions, and urban air quality.

In 2020, Sentinel-5P satellite data revealed significant reductions in nitrogen dioxide levels over major cities during lockdowns, illustrating its effectiveness in pollution monitoring.

Disaster management and mitigation:

Remote Sensing aids in early warning and management of natural disasters like floods, cyclones and wildfires. Satellites can provide real-time **flood maps** to detect forest

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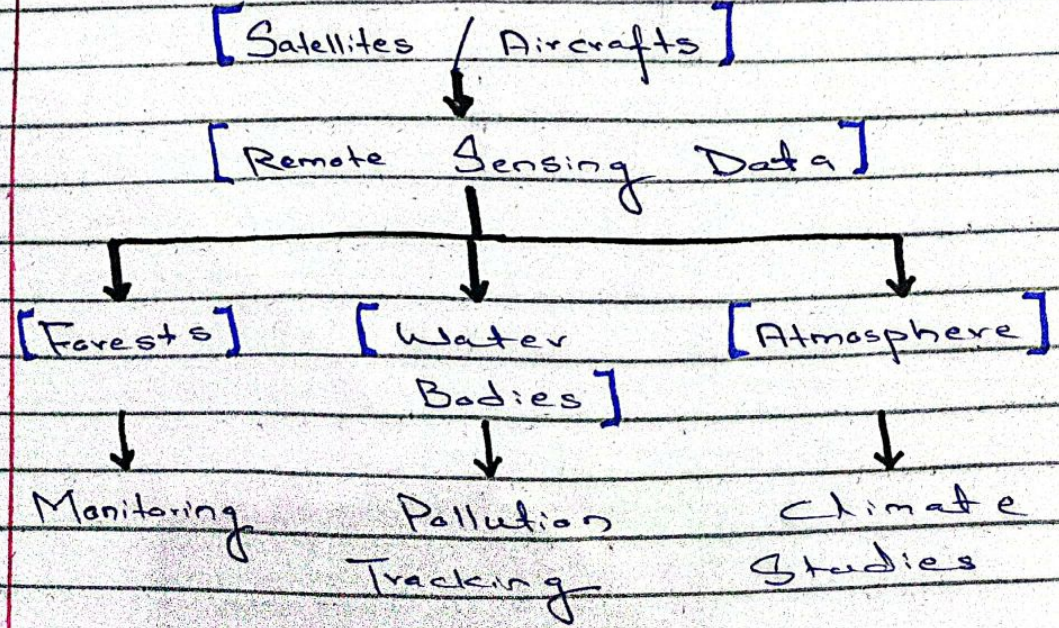
fires, enabling rapid response. The 2019 Amazon forest fires were monitored through satellite imagery, which helped coordinate firefighting and relief efforts.

Climate change and environmental research:

Satellites collect long term data on temperature, sea level rise, glacier retreat, and vegetation changes. This data supports climate modeling and helps scientists understand the impacts of global warming.

For example, the European Space Agency's Climate Change initiative uses remote sensing to track greenhouse gas concentrations globally.



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Section-B

Q.No. 7.

If 40% of a number is equal to two third of another number, what is the ratio of first number to the second number?

Let the first number = x

Let the second number = y

40% of a number = $0.4x$

Two-thirds of another number $= \frac{2}{3}y$

$$0.4x = \frac{2}{3}y$$

Divide both sides by y

$$0.4\frac{x}{y} = \frac{2}{3}\frac{y}{y}$$

$$0.4\frac{x}{y} = \frac{2}{3}$$

$$\frac{x}{y} = \frac{2/3}{0.4}$$

Convert 0.4 into fraction

$$0.4 = \frac{2}{5}$$

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$$\frac{x}{y} = \frac{2/3}{2/5} = \frac{2}{3} \times \frac{5}{2}$$

$$= \frac{5}{3}$$

In ratian

$$x : y = 5 : 3$$

b) On selling 17 balls at Rs. 720, there is a loss equal to the cost price of 5 balls. The cost price of a ball is;

Given:

Selling 17 balls = 720 Rs

Loss = Cost price of balls.

To find:

Cost price of one ball = ?

Solution:

Let the cost price of one ball = Rs x

Then cost price of 17 balls = 17x

Loss = cost price of 5 balls = 5x

Use the Loss formula

Loss = Cost Price - Selling Price

$5x = 17x - 720$

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$5x = 17x - 720$

$720 = 17x - 5x$

$720 = 12x$

$x = \frac{720}{12} = 60$

Cost price of one ball = Rs. 60

C. A man is 24 years older than his son. In two years, his age will be twice the age of his son. The present age of his son is:

Given:

A man is 24 years older than his son

In 2 years, his age will be twice the age of his son.

To find,

Percentage of the Son = ?

Solution:

Let the son's present age = x years

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Then the man's present age
$= x + 24$ years.

Son's age after 2 years
$= x + 2$

Man's age after 2 years
$= x + 24 + 2$
$= x + 26$

Man's age after 2 years = 2 × Son's age after 2 years

$x + 26 = 2(x + 2)$

$x + 26 = 2x + 4$

$26 - 4 = 2x - x$

$22 = x$

The present age of Son
$= 22$ years.

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D. Rashid and Kamran are working on an assignment. Rashid takes 6 hours to type 32 pages on a computer, while Kamran takes 5 hours to type 40 pages. How much time will they take, working together an two different computers to type an assignment of 110 pages?

Given:

Rashid type 32 pages in 6 h
Kamran type 40 pages in 5 h
Total assignment = 110 pages

They work together an two computers.

To find:

How much time will they take,

Solution:

Rashid's rate:

$$\text{Rate} = \frac{\text{Pages}}{\text{Time}} = \frac{32}{6}$$

$$\frac{16}{3} \text{ Pages / hour}$$

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Kamran's rate:

$$\text{Rate} = \frac{40}{5}$$

$$= 8 \text{ pages / hour}$$

Combine typing rate

Combined rate = Rashid's rate + Kamran's rate

$$= \frac{16}{3} + 8$$

Convert 8 into fractions

$$8 = \frac{24}{3}$$

$$\text{Combined rate} = \frac{16}{3} + \frac{24}{3}$$

$$= \frac{40}{3} \text{ pages / hour}$$

Time to type 110 pages together

$$\text{Time} = \frac{\text{Total pages}}{\text{Combined rate}} = \frac{110}{40/3}$$

$$= 110 \times \frac{3}{40}$$

$$\text{Time} = \frac{330}{40} = 8.25 \text{ hours}$$

Convert to hours and minutes

0.25 hours = 0.25 × 60 = 15 minutes

Time = 8 hours 15 minutes

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